

REMARKS

This paper responds to the Office Action mailed on October 18, 2005.

No claims are amended or canceled, and claims 60-62 are added; as a result, claims 1- 13, 52-53 and 60-62 are now pending in this application.

No new matter is proposed. Support for the new claim 60-62 can be found in the specification as filed, for example, paragraph 31 (claim 60); paragraph 35 (claim 61), and paragraph 26 (claim 62).

§102 Rejection of the Claims

Claims 1-4 and 8-13 were rejected under 35 U.S.C. § 102(e) for anticipation by Summerfelt (U.S. 6,362,068). Applicant contends the Examiner has failed to meet the burden for a novelty rejection.

Claim 1 recites, in part, “at least two layers of said plurality exhibit different degrees of oxidation.” Claim 8 recites, in part, “a second high-K capacitor dielectric comprising said metallic element, having a lower oxygen density than said first high-K capacitor dielectric.” Claim 12 recites, in part, “wherein said second high-K capacitor dielectric contains a second amount of oxygen per unit volume different from said first amount.” Applicant can not find these features in Summerfelt. The Office Action admits that Summerfelt fails to expressly teach these features (Office Action page 3). The Office Action goes on to assert that Summerfelt inherently teach these limitations because Summerfelt discloses metal rich dielectric layers (Office Action page 3).

The Office Action maintained that these features are inherent in Summerfelt because Summerfelt discloses metal-rich dielectric layers. Applicant respectfully disagrees because the Office Action has not established a *prima facie* case of inherency because, as recited in MPEP § 2112, “In relying upon the theory of inherency, the Examiner must provide basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art,” citing *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original). In support of the inherency position, the Office Action states that

The disclosure of SrTiO_x and BrSrTiO_x is a disclosure of metal layers that are fully oxidized. By doping one of the layers with a metal the doped layer would have a lower degree of oxidation because free metal is present in the that layer. (Office Action page 5)

Applicant traverses this position on multiple grounds. First, Applicant can not find where Summerfelt teaches or suggests SrTiO_x and BrSrTiO_x . Summerfelt teaches SrTiO_3 and BrSrTiO_3 in its abstract. Stated another way, Applicant can not find where Summerfelt teaches a variable oxygen level in these SrTiO_3 and BrSrTiO_3 layers. Second, as Summerfelt teaches only O_3 levels in its dielectric layer, it does not teach or even suggest exhibit different degrees of oxidation, a lower oxygen density, or a second amount of oxygen per unit volume different from said first amount as variously recited in the claims.

Third, the above quoted statement by the Examiner appears to state that the addition of Br to the SrTiO_3 leaves a free metal. The Applicant traverses this statement. The more precise formula for BrSrTiO_3 is $\text{Br}_x\text{Sr}_{1-x}(\text{TiO}_3)$. That is, TiO_3 is divalent. It can bond with two electrons. Both Barium and Strontium have two electrons available for bonding. Thus, BrSrTiO_3 as taught in Summerfelt is merely a mixture of BrTiO_3 and SrTiO_3 . Accordingly, Summerfelt's SrTiO_3 and BrSrTiO_3 layers each would have the *same* degree of oxidation. As the present claim 1 recites that the layers have a different degree of oxygenation, the claim is not anticipated by Summerfelt.

If the Applicant is not interpreting the statement in the Office Action in the manner intended by the Examiner, the Applicant respectfully requests clarification for possible appeal.

Claim 8 recites, in part, “a second high-K capacitor dielectric comprising said metallic element, having a lower oxygen density than said first high-K capacitor dielectric.” Claim 12 recites, in part, “wherein said second high-K capacitor dielectric contains a second amount of oxygen per unit volume different from said first amount.” For substantially the same reasons as stated above, Applicant asserts that Summerfelt does not teach or suggest these features.

Fourth, Applicant can not find where the Office Action asserts that the allegedly inherent characteristic is necessary. Applicant respectfully submits that the above quoted features of the independent claims do not necessarily flow from Summerfelt because for the reasons stated above.

To serve as an anticipation when a reference is silent about the asserted inherent characteristic, the gap in the reference may be filled with recourse to extrinsic evidence. But, such evidence must make clear that “the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.” *Continental Can Co. v. Monsanto Co.*, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991). Applicant respectfully submits that the Examiner has not produced extrinsic evidence to show that the “at least two layers of said plurality exhibit different degrees of oxidation,” “a second high-K capacitor dielectric comprising said metallic element, having a lower oxygen density than said first high-K capacitor dielectric,” and “wherein said second high-K capacitor dielectric contains a second amount of oxygen per unit volume different from said first amount” as recited in claims 1, 8, and 12, respectively, are necessarily present in Summerfelt.

Significantly, the Examiner has previously attempted to reject these claims as being anticipated by Summerfelt. (See Office Action dated 8/20/04 at p. 3-4.) In response, Applicant addressed the distinctions of the claims from Summerfelt. (See Response to the Office Action dated 8/20/04 at p. 5.) Specifically, Applicant highlighted claim 1's limitation that at least two layers (of a plurality of high-K dielectric layers) exhibit different degrees of oxidation. Dependent claims 2-4 benefit accordingly. Claim 8 requires its second high-K capacitor dielectric have a lower oxygen density than the first high-K capacitor dielectric. Dependent claims 9-11 benefit accordingly. Claim 12 requires that the second high-K capacitor dielectric contains an amount of oxygen per unit volume different from the amount per unit volume in the first high-K capacitor dielectric. Claim 13 requires that one of the sub-layers of the dielectric is more oxidized than another sub-layer of the dielectric. Applicant contended such clarifications overcome the Summerfelt novelty rejections.

The Examiner appears to admit that Summerfelt fails to express the limitations addressed above. (Office Action dated 8/4/05 at p. 3.) Nevertheless the Examiner attempts to argue that Summerfelt inherently teaches these limitations. (*Id.*)

Applicant contends the Examiner's announcement is contrary to binding case precedent-- *In re Zurko* (258 F.3d 1379, 59 U.S.P.Q.2d 1693 (Fed. Cir. 2001)). In *Zurko*, the Patent and Trademark Office (PTO) rejected Zurko's claims, indicating that at least one of the claim limitations was not explicitly disclosed by the cited art; nevertheless, the PTO announced that

such a limitation was inherent. (See *id.* at 1695. A copy of **Zurko** is included in an appendix to this Response.) In reversing the PTO, the Court held that the PTO cannot simply make such conclusions with respect to core factual findings in determining patentability. (See *id.* at 1697.) Rather, the Court required that the PTO "point to some concrete evidence in the record" to support its findings concerning aspects of the relevant technology. (*Id.*)

The current facts are analogous: the Examiner admits that Summerfelt fails to expressly disclose limitations in claims 1-4 and 8-14; but the Examiner argues such limitations are inherent in Summerfelt's express disclosure of "metal-rich dielectric layers." (Office Action dated 5/4/05 at p. 3.) Because that announcement serves as the basis for a novelty rejection, that announcement represents a core factual finding relevant to patentability.

Further, the Examiner has failed to satisfy his burden of proof to required for inherency. "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51. The Examiner responded to this argument claiming that "The disclosure SrTiOx and BaSrTiOx is a disclosure of metal layers that are fully oxidized. By doping one of the layers with a metal the layer would have a lower degree of oxidation because of the free metal in that layer."

Applicant contends that the Examiner fails to satisfy the burden of proof. "In relying upon the theory of inherency, the Examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990). While the Examiner attempts to rely upon *Summerfelt's* supposedly express disclosure of "SrTiOx and BaSrTiOx ", he fails to satisfy his burden of proof. There is no citation to specific excerpts of *Summerfelt*. Applicant cannot locate a reference to "SrTiOx and BaSrTiOx " in *Summerfelt*. Furthermore, Applicant could not find any reference whatsoever to differing levels of oxidation in *Summerfelt*.

In fact, the art in *Summerfelt* only discloses an O₃ level of oxidation. Every mention of SrTiO₃ and BaSrTiO₃ in *Summerfelt* contain only an O₃ level of oxidation. (See Abstract at pg 1,

Summary of the Invention at pg 3). In addition, the alternative examples in *Summerfelt* disclosed in Table 2 only disclose O₃ levels of oxidation for each and every alternative possible semiconductor material. (See Table 2 pg 4-5).

In contrast, claim 1 recites, in part, “wherein at least two layers of said plurality exhibit different degrees of oxidation”. As assumed herein, *Summerfelt* does not teach this feature of claim 1. Accordingly claim 1 is allowable. Dependent claims 2-4 benefit accordingly. Claim 8 recites, in part, “a second high-K capacitor dielectric comprising said metallic element, having a lower oxygen density than said first high-K capacitor dielectric, and contacting said first high-K capacitor dielectric.” As assumed herein, *Summerfelt* does not teach this feature of claim 8. Accordingly claim 8 is allowable. Dependent claims 9-11 benefit accordingly. Claim 12 recites, in part, “wherein said first high-K capacitor dielectric contains a first amount of oxygen per unit volume, and wherein said second high-K capacitor dielectric contains a second amount of oxygen per unit volume different from said first amount.” As assumed herein, *Summerfelt* does not teach this feature of claim 12. Accordingly claim 12 is allowable. Claim 13 recites, in part, “wherein one of said sub-layers is more oxidized than another of said sub-layers.” As assumed herein, *Summerfelt* does not teach this feature of claim 13. Accordingly claim 13 is allowable.

Applicant further requests that the Examiner prove a specific reference to *Summerfelt* where all elements of claims 1, 8, 12, and 13 are believed, by the Examiner, to be taught.

As a result, the Examiner's announcement is not only a misinterpretation of *Summerfelt* but also lacks citation to concrete evidence in the record. Such makes the Examiner's statement legally improper given the standards enumerated in *Zurko, Levy, and Robertson*, and is tantamount to an invitation for reversal by the Board or by the Court.

Applicant also notes that withdrawing the current *Summerfelt*-based novelty rejection would have the additional benefit of maintaining consistency with the Examiner's previous withdrawal of a *Summerfelt*-based novelty rejection.

§103 Rejection of the Claims

Claims 5-7, 52, and 53 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Summerfelt* (U.S. 6,362,068) in view of comments in the Office Action. Applicant respectfully traverses and asserts that a *prima facie* case of obviousness has not been made.

Claims 5-7 depend from claim 1 and are believed to be allowable therewith at least for the reasons stated above.

Claim 52 recites, in part, “wherein at least one layer of said plurality manifests greater oxidation than would an equal thickness of an underlying layer of said plurality.” For at least the reasons stated above, e.g., Summerfelt has the same oxidation (O₃) in each level, greater oxidation in another level does not necessarily flow from the teachings of Summerfelt, different oxidation degree in layers is not inherent, Summerfelt does not provide a valid reference for a *prima facie* case of obviousness.

The Examiner rejected claims 5-7 as being obvious, citing Summerfelt as the only reference. The Examiner justified the rejections based in part on the arguments applied against claims 1-4 in the attempted novelty rejections. However, as mentioned above in part I, the Examiner's arguments against claims 1-4 are defective in that (1) the Examiner failed to cite concrete evidence in the record supporting the Examiner's interpretation of Summerfelt; (2) Summerfelt itself fails to support the Examiner's interpretation of that reference; and (3) the Examiner's interpretation of Summerfelt's express and inherent teachings fail to address the relevant claim limitations anyway. Applicant further contends the Examiner's additional basis for the §103 rejection of claims 5-7 fail to cure or even address such defects. As a result, the faulty initial basis renders the §103 rejection of claims 5-7 untenable.

Moreover, the Examiner's additional basis for the §103 rejection of claims 5-7 exhibits additional defects, thereby making the §103 rejection of claims 5-7 even more untenable. The Examiner's additional basis begins with an admission that Summerfelt fails to disclose the dielectric thickness limitations of claims 5-7. (Office Action dated 5/4/05 at p. 3.) Nevertheless, the Examiner announces that such limitations are “an obvious matter of design choice,” “bounded by well known manufacturing constraints,” and “ascertainable by routine experimentation and optimization.” (*Id.*) Applicant contends that the Examiner's opinions on design choices, well known manufacturing constraints, and what is routine experimentation in the art without citation to concrete evidence in the record is once again in conflict with binding case precedent. (See **Zurko**, 59 U.S.P.Q.2d at 1697 (prohibiting the Examiner from simply reaching conclusions based on the Examiner's own understanding or experience concerning what is known in the art and instead requiring the Examiner to point to concrete evidence in record).)

The Examiner then attempts to argue that Applicant has not established that the claim limitations are non-obvious. (Office Action dated 5/4/05 at p. 4.) However, Applicant reminds the Examiner that the initial burden is not on the Applicant to establish non-obviousness; rather, the Examiner has the initial burden to establish *prima* facie obviousness. (*In re Rijckaert*, 9 F.3d 1531, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). A copy of the case is included in an appendix to this Amendment.) Applicant contends that the Examiner's baseless opinions concerning Summerfelt's inherent teachings and the state of the art in general fail to satisfy that burden.

Nevertheless, Applicant contends non-obviousness is established by Summerfelt – the very reference the Examiner attempts to rely upon. In fact, an analysis of Summerfelt demonstrates that the Examiner has once again misinterpreted that reference. Specifically, in rejecting claims 5-7, the Examiner only went so far as to admit that Summerfelt fails to disclose their thickness limitations. (Office Action dated 5/4/05 at p. 3.) However, Applicant contends Summerfelt goes further and actively teaches away from the limitations. Claim 5, for example, limits its plurality of high-K dielectric layers to defining a thickness of at most 200 angstroms. Summerfelt, on the other hand, discloses a strontium titanate/barium strontium titanate/strontium titanate dielectric stack that is 1000 angstroms thick. (Summerfelt at col. 3, ln. 39-42 (disclosing a stack that is "100 nm," wherein 1 angstrom=0.1 nanometers).) Summerfelt subsequently discloses a barium strontium titanate film that is itself 1000 angstroms thick. (See *id.* at ln. 58.) Moreover, Summerfelt warns that thinner dielectrics substantially lower the dielectric constant (*id.* at col. 3, ln. 59-62) while touting the need in the industry for high dielectric constant (*id.* at col. 1, ln. 21-24). Thus, Summerfelt's (1) specifying a dielectric stack that is five times the thickness allowed for in claim 5; and (2) warning against thin dielectric stacks by (3) suggesting that such bucks the desired trend toward high-k discourage an ordinary artisan from the limitation in claim 5 directed to a relatively thin plurality of dielectric layers. Dependent claims 6-7 benefit accordingly.

The Examiner also cited case precedent in an attempt to justify the rejections. (Office Action dated 5/4/05 at p. 4.) However, none of those cases appear to address the current situation, where the cited reference diametrically opposes the claimed invention. At best, the cases' prior art appeared to be silent concerning the relevant claim limits. In *Rose*, for example,

the Court acknowledged that the prior art disclosed lumber packages that "can" be lifted by hand; but neither the Court nor the appellant indicated that such art teaches away from the relevant claim limitation of a lumber package sized to require lifting by truck. (*In re Rose*, 220 F.2d 459, 105 U.S.P.Q. 237,240 (C.C.P.A. 1955).) In *Rinehart*, the Court expressed that there was nothing to indicate the prior art processes were ineffective on the commercial scale required by the claim at issue. (*In re Rinehart*, 531 F.2d 1048, 189 U.S.P.Q. 143, 148 (C.C.P.A. 1976).) In *Gardner*, the patentee attempted to distinguish from the prior art by arguing that such art "does not specify" the claimed dimension. (*Gardner v. TEC Sys.*, 725 F.2d 1338,220 U.S.P.Q. 777, 785 (C.A.F.C. 1984).) In *Dailey*, the Applicant attempted to address the prior art by arguing such art was "devoid of any suggestion" concerning the claimed dimension. (*In re Dailey*, 357 F.2d 669, 149 U.S.P.Q. 47,49 (C.C.P.A. 1966).) Thus, assuming *arguendo* that the case precedent supports the Examiner's statement of the law, those cases are distinguished from the current facts, and the Examiner's proposition is therefore inapplicable.

Applicant notes the Examiner has previously cited this string of cases to justify an obviousness rejection based on a single reference. (Office Action dated 8/20/04 at p. 5 (citing Horiike - U.S. Pat. No. 5,290,609).) Applicant made a similar counter argument in the Response to the Office Action dated 8/20/04 (at p. 7), pointing out that Horiike actively teaches away from the rejected claims; and the rejection was withdrawn. Applicant submits the current rejection should be withdrawn similarly.

Further support for withdrawing the rejections stems from further distinction of the current facts from those in the Examiner's cases. Specifically, claims 5-7 contain more than dimensional limitations distinguishing themselves from Summerfelt. Namely, those claims also incorporate claim 1's limitation directed to at least two layers of a plurality of high-K dielectric layers exhibiting different degrees of oxidation. Applicant established above in part I that Summerfelt fails to expressly or inherently disclose such a limitation. The Examiner's citations to *Rose*, *Rinehart*, *Gardner*, and *Dailey* do not address that failure.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney (612) 349-9587 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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